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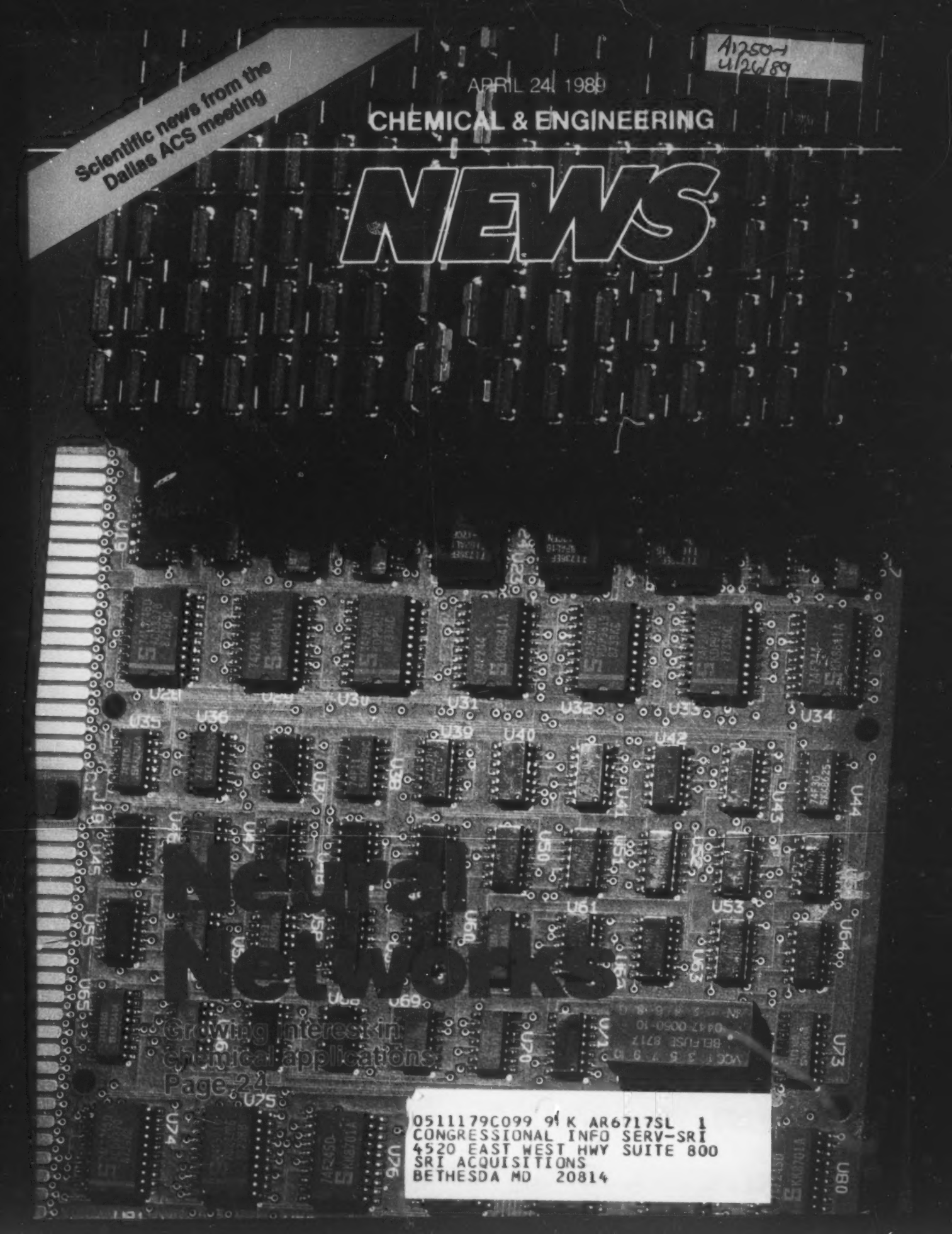
APRIL 24, 1989

CHEMICAL & ENGINEERING

NEWS

Scientific news from the Dallas ACS meeting



Neural Networks

Growing interest in chemical applications

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APRIL 24, 1989

News of the Week

■ **New data are emerging from researchers at University of Utah, other labs, but skepticism persists over Utah claim of a sustained fusion reaction in simple electrochemical cell.** Page 4

■ **D. Allan Bromley, a Yale physics professor, apparently has been chosen as White House science adviser.** Page 5

■ **Delegates from U.S., 35 other nations meet in Helsinki to explore faster phaseout of CFCs.** Page 5

■ **Planned merger of agricultural businesses of Dow Chemical and Eli Lilly will create one of world's biggest agricultural product companies.** Page 6

Cover: Floating point processor for IBM PC/ATs is used to create large-scale neural network simulations. Photo courtesy of Science Applications International Corp.

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News Focus

Kyle Olson of the Chemical Manufacturers Association discusses the complexities inherent in verifying a chemical arms treaty. **Page 7**

Business

U.S. consortium signs trade agreement with Soviet group, opening way to joint ventures; West European venture helps restore order to PVC market; now publicly traded, Arco Chemical reports strong sales, earnings in 1988. **Page 15**

Government

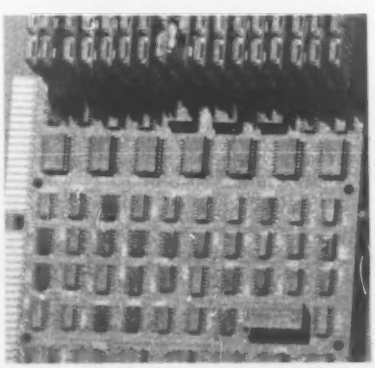
White House, Congressional agreement on framework for fiscal 1990 budget decisions spells good news for science; Department of Health & Human Services creates two new offices to deal with science misconduct issues. **Page 19**

Science/Technology

From ACS meeting in Dallas: Plenary session addresses biotechnology and environment; field tests of recombinant organisms can be carried out safely; improved polymeric adsorbents for HPLC developed; vapor deposition is key to new lubrication method; many foods contain anticancer substances; more effort needed in coal combustion research; first direct observation of friction at atomic level made; NMR finds new uses in surface science, catalysis studies; flexible plastic robot fingers have electrically activated grasp; advances made in biotechnology route to tenacious adhesives; improvements made in processes for formaldehyde and for acetal copolymer. **Page 28**

ACS News

Photos from Dallas indicate variety of activities held during society's national meeting. **Page 44**



Cover Story

Interest in the use of neurocomputer systems in chemical applications is growing, as systems show promise for predicting chemical reaction products, drug side effects, protein folding. **Page 24**

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LETTERS

Fraud in research

SIR: The question of fraud and carelessness in research (particularly biomedical research) is getting continued publicity and is attracting the attention of not just the granting agencies like the National Institutes of Health, but even of Congressional committees. Exaggerated or not, there is a growing concern among the public that all is not well, and the probity of the scientific enterprise is coming increasingly into question. Clearly universities are going to be asked to institute formal policies to deal with such matters, and I feel serious apprehension about the complications this will entail. In the meantime, working scientists must recognize the problem and take steps to decrease the frequency of such betrayals of our scientific ethics. I feel strongly that, at least in my own field of chemistry, two major keys to meeting the problem are simply the keeping of good records, and the proper assumption of responsibility by senior investigators. These are matters on the importance of which we all agree, but their implementation is easily eroded by carelessness, impatience, and the rush to get out results. In fact, I will make no claim to have always been blameless myself.

Deliberate fraud by senior investigators is rare, and in academic chemistry I cannot recall a clear-cut case during the 50 years I've been in the business. Fabrication of data by students (or other junior members of a research group) is, unfortunately, not as uncommon and occurs most frequently to meet a deadline, to complete a thesis or publication, or to force recalcitrant experiments to fit some preconceived pattern. This side of deliberate fraud, there is, as we all know, a large morass, which I may call subjective treatment of data. Into this we all step, and, occasionally, some of us become badly mired. Basically, it involves selecting and arranging data to support a favored hypothesis. Much of this is legitimate, and indeed necessary if a comprehensible publication is to be distilled from a mass of data accumulated over a long period. On the other hand, as we grow increasingly enamored with our hypotheses, such selection can easily get out of hand. Since confidence in our own ideas and the ability to present our results in the most favorable light increase with experience, it is here that senior investigators most often go astray. We all have to walk a delicate line, and occasionally step over it. Such overly subjective interpretations of data are probably a major source of the polemics that occasionally burst forth and enliven our science. Some are significant, but many rather trivial.

The canons of science demand that experiments be clearly described and their results honestly reported. That this is being done can be validated only if complete and accurate records are maintained. That this is being done within his (or her) group is clearly one of the serious responsibilities of a senior investigator. Students and junior colleagues need to be instructed on how, and in how much detail, records should be kept, and a responsible investigator needs to periodically check that records are satisfactory and are being properly preserved.

Although there is (or at least used to be) some instruction in the matter in undergraduate courses, the practice of good record keeping does not necessarily come naturally to students. That they learn and become accustomed to it is, however, most important in the training of young scientists if they are going to develop into mature and independent investigators. Industry certainly gives it great weight, and insists on detailed records of all research, both for patent purposes and legal protection.

Although most students and junior investigators intend to be honest, good and meticulous records are also a strong disincentive to fudging data, overlooking inconvenient results, and giving undue weight to sloppy or incomplete work. This makes them an important barrier to both fraud and the undue massaging of data in the first place, not to mention that good records are vital in identifying the source of trouble if results cannot be reproduced or published work comes under criticism.

Responsibility and good records become particularly important when cru-

Corrections

- March 27, page 7: Levels of sulfur dioxide and nitrogen dioxide should have been expressed as μg per cubic meter, not μg per square meter.
- April 10, page 25: The starting compound depicted in the diagram should have been $(C_6H_5)_2C{=}N\text{-}CH_2CO_2tBu$, not $(C_6H_5)_2{=}N\text{-}CH_2CO_2tBu$.